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## THE ECONOMIC ASPECT OF COST ACCOUNTS AND ITS APPLICATION TO THE ACCOUNTING OF INDUSTRIAL COMPANIES

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The subject of this paper is one of much importance to commerce and it is well that before this assembly of economists it should be considered first from its theoretical aspect, namely, the economical principles involved in determining the cost of any given article of manufacture. These principles are not so generally understood as they should be, and experience tends to show that ignorance of them is one of the causes of excessive and detrimental competition. In discussing this subject it is necessary to refer to first principles which to some of you may appear elementary.

The term "manufacture" must here be used in its widest and most theoretical sense as including every operation necessary to convert a natural product to the use of mankind. In this sense it will be seen that it must also include transportation as an element which enters largely into the cost of all articles offered for sale, even if it be only the conveyance of natural products from the garden into the house. In other words, manufacture is any operation which renders a natural product available for use and by so doing gives it a value based upon cost in excess of that which it had in its natural state.

The elements that enter into this process of manufacture as so defined are:

1. The natural product itself, or Material.
2. The subsistence necessary for the labor or service employed in converting it to use in the place where it is required, or Labor.
3. The period during which the natural product has to be used or the subsistence has to be provided until by the sale of the finished product an exchangeable value is obtained therefor, or Time.

In these elements nothing in the nature of profit is involved, for the reason that it is represented by the difference between the actual cost of labor and the value which the combination of labor with material has given to the finished product, this being dependent on the demand for and supply of the particular article.

The resultant value so fixed may at any moment be more or less than the cost of the primary element, and if it exceeds this cost there is a profit which is divisible among the three elements represented by—

1. The owner of the natural product, whether it be the state or a private individual.

2. The individuals whose joint efforts have converted this natural product into the shape for which and to the place where the demand exists, *i. e.*, labor.

3. The owner of the accumulations which are used to provide for the subsistence of the owner of the natural product and of the labor during the period of manufacture, *i. e.*, the capitalist.

If, on the other hand, the selling value falls short of the cost the loss must fall upon the owner of the natural product and the capitalist, labor merely going without profit. The owner of the natural product is in fact also a capitalist, so that for practical purposes the division of profit is between capital and labor only, and the loss is borne entirely by capital which also in practice bears an additional loss because labor is usually able to obtain more than mere subsistence cost, that is, to obtain in advance a definite sum in lieu of its share of the prospective profit.

The continued conflict between labor and capital thus resolves itself into a fight between these two naturally opposed bodies for a more equitable division of the profit remaining over actual cost, each side as a rule honestly believing that the other is getting too large a share.

At first sight it may appear that this elementary description loses sight of the important part which land, buildings, plant, and machinery play in the process of manufacture. A little consideration will show that this is not so; but that these too fall naturally into the elements already given, each item involving the use of a natural product and its conversion by means of labor over a period of time necessitating the provision of subsistence by a capitalist. For instance, the conversion of ore into manufactured steel involves the following operations:

1. Natural products consumed, *i. e.*, ore, coal, timber, etc.

2. Natural product used but not consumed, *i. e.*, land upon which to carry on operations.

3. Labor—

(a) Extracting ore in some very primitive way.

(b) Smelting this ore in some equally primitive way,

and with the use of fuel of some sort, both these processes being carried out as by savages with no provided facilities.

(c) The manufacture of some kind of tools by using the natural products so far developed and so gradually and over long periods of time constructing plants suitable for manufacture.

(d) The actual manufacture of the articles which are of use to the community and have an exchangeable value out of which profit can be realized.

A more detailed consideration of the three elements of material, labor, and time will serve to bring out the principles involved in their determination.

Materials are either mineral, vegetable, or animal. Minerals are exhaustible and no methods are known of replacing them in any conceivable period of time. Vegetables, including principally timber, either perpetuate themselves or are capable of reproduction with the aid of labor in a reasonable period, subject to certain limitations as to soil and climate; while animals increase and perpetuate themselves in natural ways subject to natural laws and to the risk of extermination by other animals, particularly man.

Material cost consists in the first instance of the labor employed in obtaining possession of it in its natural state, but the value is fixed from day to day by man's estimate of the probable supply and demand and the difficulties and cost of making it available. The purchase price so fixed is in practice accepted as the cost, although it necessarily involves profit to the original possessor and to subsequent owners through him, who are able by virtue of the limitation in quantity available at any time to demand a sum down rather than wait for the uncertainties of future profit. The purchase price thus forms part of the cost and should be recouped on sale before any profit can be ascertained. Unfortunately in the case of many natural products, particularly of the vegetable kind such as timber and agricultural products grown on virgin soil, one most important element of cost has been largely overlooked, and that is the necessity of replacing or perpetuating the supply. In our own country we have evidences of this fact always before us in the wasteful destruction of splendid forests with little or no attempt at replanting, and in the worked out soils on the western prairies where crops have been grown for a generation by extracting all the natural wealth of the soil and

leaving behind exhausted land. The same process has gone on in other countries from the most ancient times and a warning against a continuance of the present conditions may be found in the dry, waterless plains in northern Africa, which have resulted from the wholesale consumption and destruction of timber by the Romans and their successors. In most European countries, as well as in India, this waste has been largely remedied by careful and systematic preservation of natural resources; and the federal government here has shown in recent years that it is alive to the vital importance of a policy of conservation.

Labor is a direct element of cost, represented by the provision of at least subsistence to those who perform it. The agitation in some countries for the payment of what is known as the "living wage" would seem to imply that all labor does not receive such subsistence. This, however, is really a question of the degree of comfort involved in the term subsistence and of the relative habits and customs of different classes of workers in different countries. Whether this standard should be higher or lower is not a question for economists but for social reformers; and it is sufficient here to note that the cost of labor, while theoretically limited to bare cost of subsistence, varies in fact, by reason of the supply of or the demand for labor of different classes, from the bare cost of living to a very comfortable sum in excess of that cost, permitting the workers to accumulate considerable savings. In effect, then, whatever share of ultimate profits the workers might eventually receive is in the majority of cases compounded for by a payment in advance, leaving the entire surplus profits to accrue for the benefit of capital, which on the other hand also has to suffer the loss if any. This exclusion of labor from all share in the ultimate profits in defiance of economic justice is no doubt a fundamental cause of the continued warfare between labor and capital, and a remedy would seem to lie in the direction of a return to the elementary principles of profit sharing, always having due regard to the fact that while capital may suffer a total loss labor at any rate is sure of its subsistence. Profit-sharing schemes, under which labor can obtain a reasonable share of the ultimate residue if any, and will thus suffer in a measure if there is no such residue, are now in operation in many important industries; and in the extension of such schemes undoubtedly lies great hope of a steady improvement in the relations between capital and labor.

The element of time enters into costs in the shape of a return to the capitalist for the use of his accumulated savings, represented either by natural products for temporary use such as land, or by natural products for consumption such as material or subsistence. The latter, being consumed, are an element of cost; the former remaining unchanged is not; the consideration given to the capitalist for permitting his accumulated savings to be temporarily used or consumed is a share of the ultimate profit, or interest. This is not theoretically, therefore, an element of cost, though in practice the demand for capital like the demand for labor is such that the capitalist is frequently able to stipulate for a fixed immediate return for the use of his accumulations, thereby, as in the case of labor, compounding for his share of the ultimate profit and throwing the whole risk of profit or loss upon the borrower. To this extent interest in such cases might perhaps be considered as an element of cost, although it seems better not only theoretically but as a matter of practice and business expediency to treat it as a division of profits. When the capitalist is himself the manufacturer no such condition exists, and interest cannot in such cases be treated in any way except as a division of the ultimate profit if any.

In the first outline of the theoretical elements of cost all profit of any kind was excluded; enough has now been said to show that this theoretical condition is impossible in practice and that in everyday affairs those who contribute to production, whether as owners of natural products, as laborers, or as capitalists, frequently compound by the receipt of a fixed sum for their share of the profit and so relieve themselves of any loss, leaving the entire ultimate profit or loss to be borne by one or more individuals among the other contributors. The amounts so paid by way of composition for these shares of profits thus come to form a part of the cost to those who continue to take the risk; and it follows therefore that the commercial cost of two identical articles, the absolute or theoretical cost of which would be identical, may be widely different because of the different conditions under which the processes of manufacture have taken place. As an instance, consider a piece of complicated machinery made entirely of steel or iron. The following possible conditions of manufacture may exist:

1. The manufacturer may own his own iron, coal, and other mines, and may at his own factories produce everything up to

the finished product. In this case his costs will include no profits except that accruing to labor.

2. He may purchase all his natural products but carry on all manufacturing himself at his own factories. In this case his costs will include the profits of the owner of the natural products as well as those of labor.

3. He may purchase from other manufacturers the whole or a portion of the parts that enter into his finished machines. In this case his costs will include not only the profits accruing to labor and to the natural products but also the profits of any number of other manufacturers who have preferred to limit their risk at a certain point of the manufacturing process, leaving to the final manufacturer of the complete finished product the whole of the ultimate profit or loss.

It is easily seen that in the first case the manufacturer's costs will be very much lower and his profits very much higher than in the other two; and, on the other hand, that he is taking much greater risks not only by reason of the longer time involved in the manufacture and the consequent greater chance of eventual fluctuations in demand and supply, but also because he has compounded with a great many more intermediaries for their share of an ultimate profit which may never be realized. A practical illustration of these conditions may be found in a comparison of the United States Steel Corporation, which owns its ore and other mines and converts these materials into finished buildings and plants, and a contracting company which buys all its finished material and itself only erects the building or plant.

Turning now from the economic to the commercial aspect of cost accounts, some further elaboration of the primary principles laid down becomes necessary.

The elements involved have been shown to be natural products or material, subsistence or labor, and time or interest; but in practice these elements are seldom found in this simple form. Natural products, as already shown, are combined with other elements with the addition of profit either to form the primary material for some other manufacturing business or to form the instruments used in the processes of manufacture, whether buildings, machinery, or equipment. The result of these more complicated groupings is that the principal headings under which commercial cost accounts fall are generally somewhat as follows:

**Material—**

1. That to which manufacturing processes are applied to convert them into some different form.
2. That which is used or consumed in the processes of manufacture.
  - (a) Directly.
  - (b) Indirectly.

**Labor—**

1. That employed directly in and upon the materials under process of conversion.
2. That employed indirectly in operations necessary for the manufacture but not a part of it, such as upon repairs to and up-keep of machinery, buildings, or equipment.

**Expenses—**

Consisting partly of material and partly of labor, which are incidental to the carrying on of a manufacturing business but have not any direct relation to the process of manufacturing.

**Wear and Tear—**

Or the gradual consumption of the buildings, machinery, or equipment employed in the manufacturing process,—more commonly known as depreciation.

Now the object of any system of cost accounts being to ascertain the cost of manufacture of each article or class of articles, it is at once evident that in a factory producing many different classes of product some method must be adopted for distributing many of the items of cost over the different classes.

Material in process of direct conversion and labor directly employed in such conversion present no difficulties, being easily chargeable to the process; and the same is true of auxiliary material consumed in the process or of auxiliary labor which can be segregated at the moment.

There is, however, a large class of items, such as rent (where payable), power, light and heat, payment of general staff of clerks and superintendents, wear and tear, and many others which cannot be distributed exactly and yet are a necessary and integral part of the cost of manufacture. These items consisting of part of the items of material and labor, and the whole of the items of expense and wear and tear, are usually grouped under

the term "overhead expense" or "burden", and distributed on a more or less arbitrary basis among the different products. This distribution involves most difficult questions, and the adoption of an erroneous method may easily appear to show that certain articles are manufactured at a cost well below their selling price while a more accurate distribution would show a reverse condition. The most usual method of distribution is by a straight percentage on the direct labor cost, and where all products are of the same nature this may give fairly accurate results; but it is not scientific. On the other hand, a more elaborate system of distribution based on an exhaustive examination of processes with a view to determining what share each operation should bear of each class of overhead expense, and requiring an elaborate analysis thereof, may involve so much expense as to be prohibitive; and the final result may be found not to differ materially from the more simple and ready method of a percentage division.

Modern factories are usually operated by departments, between which there are well marked divisions. Each department within its own limits occupies a certain floor space, involving light and heat proportionate thereto; uses an amount of power which can be estimated within reasonable limits; and has certain labor and other costs for general assistance, cleaning, stores, and superintendence, which belong entirely to its operations in total. All these can be charged to the department and serve to determine the burden of that department. Some items, such as rent (if any), insurance, heating, and light, may be charged to the department on the basis of floor space; others, such as steam or electric power, on the basis of horse power hours worked; others again, such as general labor, on the basis of the direct labor pay roll; and others, such as superintendence and general expenses, on the basis of labor and material costs combined. This main division is a comparatively simple one, although the circumstances of each case require careful study in order to determine the most nearly correct method; and if the industry is such that each department is carrying out only one class of operation, easily measured on some unit basis, the division of this burden over unit costs presents few difficulties. It is in cases where the operations in a department are of a varied and complicated nature, such, for instance, as a large machine shop, that almost insuperable difficulties arise; and it may well be doubted whether any really accurate distribution is possible.

In considering the item of overhead expense, it is necessary to emphasize the distinction which must be made between expenses necessary for the production of manufactured articles in a form in which they are ready for sale and the expenses incurred in offering them for sale to the public and in carrying through the sales when made. The former item, as has already been shown, is an essential element of cost of manufacture; the latter is an essential element of cost only from the point of view that without such expense the products could not be sold and the profits could not be earned. Strictly speaking, therefore, these selling expenses should be deducted from the price ultimately obtained for the product, and the difference only should be considered as the amount realized for the manufactured article. In practice this same result is often achieved in a different way by distinguishing between manufacturing cost and selling cost, manufacturing cost alone being employed for the purpose of valuing the product which remains on hand unsold at the time of taking an annual inventory, and selling cost being dealt with only in memorandum form in order that those engaged in selling the products may know the limit below which they should not be disposed of.

The necessity for accurate cost keeping by commercial enterprises lies in the fact that without such cost keeping, whether it be of a highly scientific nature or merely by rule of thumb, it is impossible for a manufacturer to know whether the price at which he decides to sell his articles will or will not yield a profit. The objection to rule of thumb methods is that they are generally quite inaccurate, except in cases where manufacturing processes are relatively simple. In the most usual cases, where the process of manufacture is divided over a number of separate departments each representing a different set of operations, any such methods can only lead to serious errors and frequently to ultimate loss.

It is necessary here to note that, while the ascertainment of accurate costs is essential, it does not necessarily follow that no profit can be realized by selling at a price which appears to be below such cost. In any factory equipped for a certain volume of production, the overhead charges will remain practically stationary whether the factory be operated to its full extent or to only a small proportion thereof. It will follow, therefore, that the unit cost of manufacture, including overhead expense, will be much higher when the factory is partly operated than when it is fully operated; and consequently a manufacturer can earn profits for himself by

selling a considerable proportion of his output at a small price over and above the direct cost excluding overhead expense, thereby reducing his unit costs and making more profit than he would have made on the smaller output. It is, however, safe to say that it would be dangerous to attempt to carry out any such procedure without an accurate knowledge of direct, overhead, and selling costs.

In the limits of this paper it is hardly possible to do more than supply this outline of the general practice of commercial cost keeping, but there are important questions as to the treatment of certain items which may be here considered.

Accountants frequently have to give opinions as to the propriety of including rent and interest in costs. In theory these two items are identical, rent being the sum paid to a capitalist for the use of land or buildings, and interest being his compensation for placing his natural product or his accumulated savings at the disposal of the manufacturer. Both items are therefore in the nature of a division of profits, out of which alone they can be met, and they should therefore be strictly excluded from costs. In practice, however, the effect of the laws of supply and demand is such that one capitalist is frequently able, as has been shown, to compound with another capitalist for his share of profits and to obtain instead a fixed payment independent of what ultimate profits may be. This fact seems, however, hardly to justify the treatment of these items as cost, but rather that they should be treated as an advance by one capitalist to another of a proportion of the profits which the former expects to realize, this proportion being accepted in full settlement of a fluctuating and doubtful future sum. This principle is recognized in the form in which railroad accounts are now prepared, where both rentals of leased lines and interest on borrowed money of all kinds are treated as a charge against the income from operations after the same has been ascertained, that is, as a distribution of profits.

In the case of manufacturing companies no such clear recognition of this principle is found, and rent for factories, etc., where paid, is always treated as an item of manufacturing cost or expense, while interest, an exactly similar item, is more usually treated as a charge against or division of profits. This method of charging rent as an expense has led to a claim that it is properly so treated, and that therefore when a manufacturer owns his premises and pays no rent an estimated amount corresponding

to the value of the use should be charged into and considered as part of the cost thereof. This sounds plausible but it is believed that a nearer approach to theoretical accuracy is to be found in the railroad practice of considering all rentals, at least when there is a natural division between rent and other service, as a charge against or division of profits.

If two manufacturers have identical facilities for manufacturing the same article and adopt the same methods and at the same expense, it is certainly not reasonable to say that the manufacturing cost of the one who rents his facilities instead of owning them is higher than that of the other who owns them; but it is reasonable and correct to say that the former, who has a smaller personal investment, is sharing his profits with the capitalist who contributes the facilities.

Similarly, in the case of interest, the manner in which capital is provided cannot affect cost of manufacture. A manufacturer may provide all his own capital or he may obtain some part of it from other capitalists who either take equal risks with himself or prefer in some way to limit their risk. The profit when ascertained has to be divided between the different capitalists according to the terms agreed upon, but no part of it should be an element of cost, nor should the method of its division be a factor in determining selling price.

This question of rent serves to show the difficulty if not impossibility in practice of laying down any hard and fast rules based upon economic principles, which are to so great an extent theoretical. Rent has so far been considered only as relating to the provision of manufacturing facilities, land, etc.; but an industry exists in which capitalists erect buildings and let them out in whole or in part to others for offices, residences, and other purposes incident and necessary to business enterprise of all kinds. Rent of a factory is clearly a distribution of profit, but it is difficult in practice to make the same claim for office rents, and yet the arguments seem almost identical. A general distinction may perhaps be made between rent paid for the use of premises which forms a direct and integral part of the manufacturing operations and that paid for premises which are merely incidental thereto; and a further distinction lies in the frequent inclusion in rent of the price for other services such as light, heat, elevator service, cleaning, depreciation, etc., all of which involve labor and profit, just as these items are involved in the purchase of material. No

general rule can be laid down beyond suggesting that wherever an item of rent appears to consist mainly of a direct division of profit it should be so treated and only considered as part of cost when it seems to be mainly a composite item of labor, material, and profit representing service rendered.

Some confusion in relation to these two items of rent and interest is found in the relation of the profits of a corporation or an individual to the profits of the business which is carried on. The latter should be identical under the same conditions of manufacture, whatever the financial arrangements may be, but the former is affected materially by the share of such profits which is distributed to others in the shape of rent and interest, as well as in commission or other payments dependent in any way upon profits. The claim is frequently made that in ascertaining the cost of a product all these factors should be taken into consideration, but this it is believed is a fallacious argument based on a mistaken idea of what constitutes profit in the abstract, as distinct from its division among the ultimate owners or stockholders. The point is an important one in so far as it may affect selling price and reasonable profit; for it certainly would not be reasonable that a manufacturer who had by hiring his factory, raising loans, sharing profits with his employees, and such kindred operations, distributed a considerable portion of his profits should then raise his prices to an amount in excess of his neighbor's who had decided to provide all his own facilities and not to share his profits with anybody.

The question is frequently raised whether distribution of profits made to employees under profit-sharing schemes, or contributions to pension funds, are proper items to include as part of manufacturing costs. This question must be answered in the negative. Labor has already received its subsistence and this is properly included as cost; any further distribution to labor, whether by way of a share of profit or a provision for old age or sickness, represents the share of labor in the profit. It must sooner or later be recognized by manufacturers that such distributions of profit to labor can only be made out of the share of profit that goes to capital, and ought not to be met by increasing the selling price to the community, unless it should appear that on general grounds the total remuneration in the way of profit to labor and capital combined is unreasonably small.

One of the important purposes served by accurate costs is to

enable a manufacturer to ascertain his profits when a considerable part of his product remains unsold. Profits can only be made out of the sale of the article manufactured; and such a factor as a general rise in prices of material and labor, after the completion of manufacture but before sale, cannot constitute profit. Hence, in ascertaining profit at any time it is essential that what is not sold should be carried over at exact cost, this cost being manufacturing cost in the condition in which the products actually are. It may also happen that products sold in advance have not been completely manufactured and cannot therefore be delivered; in the latter case the cost of manufacture so far as completed and the cost of sale together represent the amount expended on the product; and, provided there is every prospect that the total cost when completed will be below the selling price after deducting cost of sale, this is the amount to carry forward. There are, however, products which must be kept for a certain time before they can either be submitted to further manufacturing processes or sold; in such cases it is customary to take up as part of the cost of the products on hand a reasonable interest on the manufacturing cost for the period for which the products may have to be so held in stock. This is an exception to the established rule, based not only on economic theory but on sound practice, that interest is not part of cost; and it is in effect taking up part of the ultimate estimated profit before it is earned; although if this addition be limited to so much of the interest as has actually accrued to lenders of capital there may be no anticipation of the profits of the corporation or individual manufacturer.

Contracts are frequently entered into on the terms that the price is to be fixed at actual cost plus a percentage thereon, and disputes sometimes arise as to what constitutes cost. These disputes are almost always due to carelessly drawn contracts, the parties thereto and their legal advisers frequently having a very loose idea of the principles involved. The importance of a clearly drawn contract is evident in view of the conflicting views on such subjects as rent, interest, bonuses, commissions to employees, and many other similar items; and if a proper form of contract exists no dispute is likely to arise. In the contrary case, however, the elementary principles of costs may be relied upon to solve the difficulty. If a manufacturer enters into such a contract, it must be assumed that he has all the facilities necessary for carrying it out and that no charge for the use of those facilities, other

than actual wear and tear thereof in the course of carrying out the contract, can be allowed as an item of cost. Similarly, no charge can be allowed for rent or interest or other items, which, according to the theory laid down, represent a share of profits on the operations. It is on these items that disputes generally arise rather than on the more complicated questions of proper distribution of burden, upon which manufacturers and contractors are usually much better informed.

During the last decade competition and the increased demands of labor have materially increased manufacturing costs, and manufacturers have recouped themselves by raising prices to the consumer. Having reached the limit in this rise which the consumer will endure, they are now leading a general attack upon the railroads of the country, alleging that the latter, which have up to the present endeavored to meet higher prices and higher labor by the introduction of economies and without any material increase in rates, should be prohibited from now raising these rates to a point which will enable them to maintain the extremely reasonable return so far yielded upon their investments. A comparison between the cost and selling price of manufactures and of transportation respectively may show that if unreasonable profits are being made it is not by the railroads but by the manufacturers; and full inquiry may well result in establishing that the extra share of profits now given to labor under profit-sharing and pension schemes has not been met by the manufacturer by a reduction in his possibly unreasonable share of the profits, as it should have been, but by an increase in prices to the consumer. No investigation into the railroad rate question can be considered complete which does not take into consideration the margin between cost and selling price, not only in transportation but in all manufacturing concerns. No such investigation can be properly undertaken without a sound understanding of the principles and elements that are involved; and it is hoped that the inadequate attempt here made to set forth some of these principles and their practical application may lead to a discussion which will be of material value as a contribution to the important question which is now agitating the country.